



BECOMING A MATHEMATICS TEACHER IN A UNIVERSITY: A GROUNDED THEORY APPROACH

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ABSTRACT

Making mathematics relevant is a challenge that requires teachers an extensive understanding on the subject and the learners. This study identifies certain characteristics teachers should possess while teaching mathematics at a university. Using Grounded theory, data were analysed using constant comparison techniques to develop the theory that "Effective mathematics teacher in a university is characterized by their expertise of the field, research, emotional maturity and morale, physical and aesthetic vitality which inspire students to appreciate and continuously learn mathematical concepts." Hence, university mathematics teachers should acquire these characteristics to facilitate motivated mathematics learning in the university.

KEYWORDS: university mathematics, mathematics teachers, grounded theory, qualitative study, mathematics.

1.0 Introduction

Teaching mathematics at a university is of great importance and value, however, extremely difficult to achieve (Baumslag, 2000). It is a fact that to make the most disliked subject easy and interesting to the learners is not an overnight task. Making mathematics more interesting and relevant to the lives of the students is a challenge that requires the teachers a deep and extensive understanding on the nature of the subject matter and the capacity of the learners to absorb it. This can only be possible when teachers do not just value the content itself but also the learner as a person and as an individual (Anthony and Walshaw, 2009).

Frei (2008) emphasized that teaching mathematics in today's diverse classrooms, including that of a university, can be challenging, but it also provides teachers with many exciting opportunities to pass on life skills as well as mathematical knowledge. The challenge is that mathematics remains a subject that suffers from a lack of participation at the higher levels and a lack of popularity at the lower levels (Schuck & Pereira, 2011). The opportunity is that mathematics teacher in a university directly influence their students on how to deal with the various spheres of private, social, and civil life (Anthony & Walshaw, 2009).

Literatures revealed that more studies were conducted on effective mathematics teaching but less on describing an effective mathematics teacher particularly on higher education. Moreover, these studies are of western perspectives. Stones (1994), for example, defines an effective mathematics teacher as one who has a thorough knowledge of the subject matter and classroom experience. The former ensures teachers have an up-to-date knowledge of the material they will be delivering and the latter ensures they can deliver it. Artzt and Armour-Thomas (2001) also characterised mathematics teacher as a great teacher that has the willingness and ability to be a reflective, self-critical thinker. Furthermore, Dr. Larson (2002) put emphasis on the ability to ask questions that ensures students' understanding as a quality of an effective mathematics teacher. He emphasized that through careful questioning and discussion, students connect previously learned mathematics with mathematics yet to be learned. These interactions between students and teachers, and between students and students, have a powerful influence on student learning.

To become a mathematics teacher in a university, however, demands more than these defining characteristics. Experiences of university teachers reveals that teaching mathematics in a university is not just about ordinary classroom teaching where the teacher transmits knowledge and information to the students. It is not just about proving that the answer to a certain problem is correct. This study, therefore, aims to investigate deeply information and facts that truly describe and characterize an ideal mathematics teacher in a university level. At the end, a framework of how it is to become a mathematics professor in a university would be theoretically defined.

2.0 Methodology

This qualitative study is anchored on the grounded theory approach pioneered by Glaser and Strauss (1967). Grounded theory method is referred to as an inductive approach in which theory is build up based on the data collected. In his study, induction of theory is achieved through successive comparative analyses (Strauss and Corbin, 1990) and narrative analysis (Soanes & Stevenson, 2004) of the information collected from 179 students in Southern Leyte State University. The constant comparison technique serves to uncover and explain patterns and variations hidden in the vast amount of qualitative data. Hypotheses are revised and qualified until they pertain to all data material, in preparation of the development and grounding of the emerging theory (Bitsch, 2005).

In this study, theory generation is not based on the raw data; it is based on concepts and categories being developed out of the raw data. The data coding and analysis of the data is conducted based on three analytic techniques: open coding, axial coding, and selective coding (Strauss, 1987; Strauss and Corbin, 1990). The final analysis was presented to the subjects twice for validating and re-validating the researchers' interpretation of the narratives and the responses during the interview (Myers, 2009).

3.0 Results and Discussion

This portion exposes the propositions developed and formulated from the patterns of information as a result of the constant comparison of the responses provided by the respondents of the study.

Proposition 1: A university mathematics teacher is a pillar of mathematical truth.

It is the aim of every school of mathematics to emphasize the mental ability of mathematics teachers for it's not desirable to have teacher in a mathematics classroom that is not mentally competent. Mathematically competent teachers are important in the sense that students acquire much of their knowledge and develop their thinking skills from classroom instruction (Cai, 2003; Lave, 1988). This suggests that university mathematics teachers must be equipped with a deep understanding of mathematical theories and concepts.

A very important component of mathematical understanding is the correct usage of mathematical language. Anthony and Walshaw (2009) suggest that university mathematics teachers should foster the use, as well as the understanding, of appropriate mathematical terms and expressions. Understanding the mathematical language used in the classroom allows the students to make sense of the mathematical ideas that they need to comprehend. Language creates conceptual understanding because it bridges the mind of the students to every mathematical concepts and ideas presented. This further implies that a university mathematics teacher can use the simplest term to describe a concept without moving away from its true meaning. University mathematics teachers present difficult concepts in the easiest way possible.

Stones (1994), exemplifies thorough knowledge of the subject matter and classroom experience as a requirement of a university mathematics teacher. The former ensures teachers have an up-to-date knowledge of the material they will be delivering and the latter ensures they can deliver it. This requires university mathematics teachers the skill to do research which continually abreast them with the innovations and modern advances in the field they are teaching. This is what makes a university mathematics teacher a source and generator of modern mathematical frameworks which paves the way to a better understanding of the complexities of mathematical concepts. With this demand, university mathematics teacher has to produce learning materials that present a more personal perspective of mathematical problems enabling Filipino students to relate scenarios presented in the problem. Presenting mathematical problems to local perspective enhances the opportunity of understanding the problem more which increases the chance of finding solutions to it.

Being equipped with deep understanding of mathematical concepts, the appropriate use of mathematical language, and the continued effort to mathematical innovations is what a mentally competent university mathematics teacher is.

Proposition 2: A university mathematics teacher exhibits professional look.

Teacher's physical appearance is one factor to capture student's esteem to learn. Some studies revealed that if a class have a teacher who has a fascinating, stunning and healthy look, he or she stimulates student's interest which creates a sounding but affirmative learning atmosphere and student's condition consistently positive until the end (Hughes, 2001; Hamermesh, 2003; Lunzaga, nd). This reflects how beauty triggers positive responses by students and leads to productive teaching.

Time Management Ninja (2013) revealed that people love to work with someone who looks professional. It can give ease and a sense of trust. The study added that dressing professionally signals that you have your stuff together and are organized. If your clothes are clean, pressed, and professional, it shows that you went the extra effort to be prepared. University students who are at their ideal age model university teachers who have this quality. It is in the students' nature as visually driven beings that they consider the look of a teacher as a characteristic that should describe a mathematics teacher.

Beebe and Beebe (1997) note that, in a public speaking realm including teaching, "there is considerable evidence that one's personal appearance affects audience response to a message, particularly during the opening moments of the presentation of an issue". Several studies indicate that more professionalism in dress influences the effectiveness of a public speaker/teaching. The persuasiveness of the teacher may be fostered from heightened perceptions of speaker competence, credibility, professionalism, etc. that professional dress tends to create. This implies that the credibility of the information delivered by teachers is sometimes assessed by their professional look.

The above literatures show how important professional look is for university mathematics teachers to create the environment of trust, command and credibility. This explains the phenomenon that teachers with professional look fascinate students' interest in the subject they are teaching. Thus, one of the ways to motivate students' interest in mathematics is on the professional look of the university mathematics teachers.

Proposition3: A university mathematics teacher is emotionally mature and with high regards to morale.

A professional teacher knows how to deal issues and problems on emotions encountered at home and in school. This is highly expected for a university mathematics teacher who is dealing students with various negative feelings on mathematics subjects. It is undeniable that literatures revealed how students really hated mathematics (Simmers, 2011; Jackson & Leffingwell, 1999; Hachey, 2009). It is then recommended that screening for the best teacher personality, including that of mathematics teacher in a university, should also focused on one's personal strengths and weaknesses and the ability to cope with the manifold behavioral manifestations of students as they continue to learn and grow under her tutelage (Salandanan, 2005). How effective a teacher is depends in part on the maturity of emotion the teacher has while teaching.

David Pack (2003) defines emotional maturity as knowing when to withhold and suppress wrong emotions and when to properly release, and sometimes openly display, healthy emotions. He added that being in a university, mathematics teachers help adolescents gain a picture of what it is like to operate in a mature fashion when they will be working. To do this, the teacher needs to be a person who is in control of his emotions, must be able to accept and live with difference, and must see himself in a "relating" rather than a "controlling" role. This would somehow change the attitude of students towards the subject. Simmers (2011) cited a student response saying:

"I think the single most important factor in learning mathematics is having a teacher who makes the experience positive. Even if you may not be "good" at math, if you have a positive experience you are more prone not to give up."

This is the time to emphasize the psychological dimension of teaching mathematics at a university. Mathematics needs a very strong academic relation between teachers and students. Stepanek (2000) believes that creating classrooms that embrace the characteristics of a community of learners is essential for rigorous mathematics teaching and learning. The environment where students learn mathematics defines their own experience and even influences their attitudes towards the subject. The influence of the classroom environment on students' motivation and enthusiasm is especially important as students are asked to develop deep understanding of challenging mathematics topics. This can only be achieved if mathematics teachers in a university are able to handle appropriately emotional issues and crisis and creates an environment that cares for mathematical proficiency (Anthony & Walshaw, 2009).

Proposition4: A university mathematics teacher extends positive influence outside the class.

While most people understand that teachers are very important in the lives of their students, many teachers don't realize how much they can truly impact their students' future lives. This goes much deeper than the lessons that are being taught (Kelly, n.d.). The influence goes beyond the walls of the classroom and even outside the perimeter of the university. This requires university teacher to

go further in their expectations, and develop lessons and activities about how students can and should contribute, in any form, the academic welfare of the community they belong.

In the following portion of a long conversation, one of the respondents revealed the reason why she wants to be a teacher:

Researcher: Are you happy with your course now?

Student: Yes. I like my course. I want to be a teacher. This makes me happy?

Researcher: Why do you want to be a teacher?

Student: I want to teach the way my teacher taught me when I was in high school. She was so kind and very friendly in the class. She made me understand mathematics. I want to be like her. She is my idol.

This conversation is an evidence that teacher influenced students' decision for their future. Teachers helped students identify, discover, and develop their own identity. As loco-parentis, it is the task of a mathematics teacher in a university to also help university students to develop a positive attitude to mathematics. A positive attitude raises comfort levels and gives students greater confidence in their capacity to learn and to make sense of mathematics in things that they do at homes, groups, and even works. The study of Knoell & Crow (2013) revealed that student-teacher relationships are built through purposeful and continual effort, primarily through mentoring on the part of the teacher. They added that "it is in the relationship between teacher and student where learning can take root and begin to grow; and the degree to which a teacher invests in that relationship not only affects learning outcomes and student behavior in the classroom, but also potentially impacts each student's future success."

Deborah Ball (2009) of University of Michigan emphasized in her lecture the shift of mode in teaching mathematics in a university. She stressed that mathematics in a university should concentrate more on the pedagogical approaches which prepares university students for academic and social outcomes. This requires mathematics teachers in a university the skills and competencies to provide the learners authentic learning tasks that would bridge the gap between theories and practical application of mathematics at the workplace. Teaching mathematics in the university is not just a cognitive endeavour. Mathematics activities in a university should allow students a genuine experience of discovering and doing mathematics in every facets of it. This is how mathematics teachers in the university offer the excellence to their students required when they will be in the field of work. Sutherland (2006) said "Young people learn mathematics at school to educate them in some way for life outside school."

From the propositions, this study concludes that Effective mathematics teacher in a university is characterized by their expertise of the field, research, emotional maturity and morale, physical and aesthetic vitality which inspire students to appreciate and continuously learn mathematical concepts.

5.0 Implication to Teaching in Mathematics

The characteristic of a mathematics teacher has a great impact on the students learning towards mathematics subject. Being in a university, mathematics teachers should exhibit positive and constructive qualities expected by their students for guidance, deeper understanding of the subject they taught, and most of all, for building a bridge of the mathematical gap created by fear and anxiety.

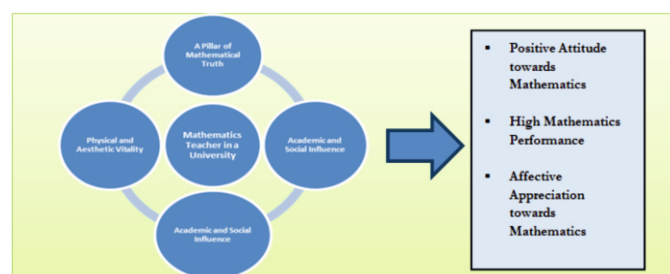


Figure 1. Hypothetical Framework on Becoming a Mathematics Teacher in a University

The hypotheses formulated as the result of the analysis reminds all mathematics teachers in the university level that teaching can be improved. Baumslag (2000) stressed that we, as mathematics teachers, should certainly put effort into improving teaching, taking and improving the tried and trusted methods - methods that do not take much time, and make a difference, which should also be cost effective, for one should remember always that there is little time. This is very important because teaching is not the only job mathematics teachers in a university have. In order to prosper in the field, aside from teaching, there is still a need to review, maintain and enlarge mathematical skills, and carry out research.

For majority of the student-participants of this study, the hypothesized desirable characteristics of mathematics teachers in a university helped them drive away their fears and lessen their anxieties in facing any mathematical problems. It changed their negative views towards the subject. In addition, they gain confidence and motivation in solving mathematical problems that lead them for a better performance. Lastly, students who are guided by expert mathematics teachers in a university would really realize the importance and worth of learning mathematics for life.

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